National Advisory Committee for Aeronautics

Research Abstracts

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CURRENT NACA REPORTS

NACA Rept. 1145

A METHOD OF CALIBRATING AIRSPEED INSTALLATIONS ON AIRPLANES AT TRANSONIC AND SUPERSONIC SPEEDS BY THE USE OF ACCELEROMETER AND ATTITUDE-ANGLE MEASUREMENTS. John A. Zalovcik, Lindsay J. Lina and James P. Trant, Jr. 1953. ii, 13p. diagrs., photos., tab. (NACA Rept. 1145. Formerly TN 2099; TN 2570)

A method is described for calibrating airspeed installations on airplanes at transonic and supersonic speeds in which use is made of normal and longitudinal accelerations and attitude angle as measured by instruments carried within the airplane. An airspeed calibration of the pitot-static installation on a jet fighter airplane is presented as an experimental check on the accuracy of the method.

NACA Rept. 1160

THE ZERO-LIFT DRAG OF A SLENDER BODY OF REVOLUTION (NACA RM-10 RESEARCH MODEL) AS DETERMINED FROM TESTS IN SEVERAL WIND TUNNELS AND IN FLIGHT AT SUPERSONIC SPEEDS. Albert J. Evans. 1954. ii, 13p. diagrs., tab. (NACA Rept. 1160. Formerly TN 2944)

Presents zero-lift drag data of an NACA RM-10 slender body of revolution with and without stabilizing fins attached. The results from several wind tunnels and in flight are compared. The results cover a Reynolds number range from about 1×10^6 to 40×10^6 for the wind-tunnel models and 12×10^6 to 140×10^6 for the flight models. The Mach numbers covered include 1.5 to 2.4 in the wind tunnels and 0.85 to 2.5 in flight.

NACA RM 54F22

EFFECTS OF MULTIAXIAL STRETCHING ON CRAZING AND OTHER PROPERTIES OF TRANSPARENT PLASTICS. Irvin Wolock and Desmond A. George, National Bureau of Standards. October 1954. 34p. diagrs., photos., 10 tabs. (NACA RM 54F22)

An investigation was made of the effects of orientation by multiaxial stretching on properties of various plastic glazing materials. The materials studied were Lucite HC-222 (polymethyl methacrylate), Plexiglas 55 (modified polymethyl methacrylate), Gafite, and resin C (polymethyl alpha-chloroacrylate). The following tests were conducted on samples of these materials stretched up to 150 percent: Dimensional stability at elevated temperatures, surface abrasion, standard tensile tests, and stress-solvent crazing tests using ethylene dichloride.

NACA RM E54H04

SLOWING-DOWN DISTRIBUTION TO INDIUM RESONANCE OF NEUTRONS FROM A Ra-α-Be SOURCE IN WATER-IRON MIXTURES. Daniel Fieno. November 1954. 16p. diagrs., photo., 2 tabs. (NACA RM E54H04)

The mean square slowing-down distance to indium resonance $\overline{r^2}$ derived from the slowing-down distribution has been measured for water and for three water-iron mixtures for neutrons from a 0.1-gram Ra-α-Be source. The values of $\overline{r^2}$ for water-iron volume ratios of 1, 2, and 3 and for water were 347, 336, 314, and 291 centimeters squared, respectively. Within the accuracy of the measurements, the relaxation length λ was approximately the same for water and for the three water-iron mixtures, the average value being 10.0 centimeters.

NACA TN 3152

TRANSVERSE OSCILLATIONS IN A CYLINDRICAL COMBUSTION CHAMBER. Franklin K. Moore and Stephen H. Maslen. October 1954. 25p. diagrs. (NACA TN 3152)

Transverse oscillations in combustion chambers are studied. With an axial temperature gradient considered, the modes of weak oscillation are described for low Mach number. Amplification by coupling with vigorous combustion in the flame-holder wake is assumed. The amplification depends on flame-holder and centerbody diameters and on time-lag effects. The nature of finite transverse periodic waves is also analyzed. Results show that such waves have frequencies independent of amplitude and do not steepen with time.

NACA TN 3302

LIQUEFACTION OF AIR IN THE LANGLEY 11-INCH HYPERSONIC TUNNEL. Charles H. McLellan and Thomas W. Williams. October 1954. 36p. diagrs., 4 tabs. (NACA TN 3302)

Pressure and scattered-light measurements were made in the Langley 11-inch hypersonic tunnel to determine the effect of stagnation temperature on the flow in two Mach number 7 nozzles and to determine the nature of the condensation process occurring at low stagnation temperatures. Liquefaction of the air occurred very close to the saturation point without a condensation shock. This result indicates that liquefaction took place on foreign nuclei such as water and carbon-dioxide particles. The results from varying the water vapor and carbon-dioxide content, however, could not be correlated with Max Volmer's condensation theory. The average particle radius was 480 angstroms in the test section of the

lach number 7 nozzle for stagnation about 530° R and 29 atmospheres. me conditions about 10^{10} particles per eter were present.

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TAL DETERMINATION OF BOUNDARY-NSITION ON A BODY OF REVOLUTION
James R. Jedlicka, Max E. Wilkins
fi. October 1954. 56p. diagrs., photos.
42. Formerly RM A53L18)

er-transition tests were made in free still air on a small-scale fin-stabilized otion of fineness ratio 30 at a Mach and length Reynolds numbers of 12 and Three types of surfaces were tested and Reynolds number was found to depend he surface smoothness. Angle of attack nfluence transition strongly. This related in terms of pressure rise along nd led to a prediction of the effect of ody shape on sheltered-side transition. e transition points were time dependent, one case over a range of Reynolds 4 to 20 million. Steady laminar flow to a length Reynolds number of 11 nsition due to roughness and adverse ient occurred even though the tests region of theoretical infinite laminar all disturbances.

ITISH REPORTS

Research Council (Gt. Brit.)
EED LABORATORY OF THE AERO-IVISION, N. P. L. D. W. Holder.
diagrs., photos., 2 tabs. (ARC

ed tunnel installation of the Aerodynam- of the National Physical Laboratory is he installation consists of the 12-in. -speed tunnel, the 20- by 8-in. high- and a number of smaller tunnels all of rated on the induction principle from a essed-air storage capacity. The new high-speed tunnel is also described. xperimental techniques which have been ribed, including the schlieren and methods. The last of the report re- erimental results obtained in the high- during and immediately before the war. a which occur on a particular airfoil reased are described and the effect of discussed.

Research Council (Gt. Brit.)
CREASE AT HIGH SUBSONIC SPEEDS.
. 1954. 16p. diagrs. (ARC R & M
246. Formerly RAE Tech. Note

The drag increase beyond the critical Mach number is calculated by modifying the supersonic part of the Karman-Tsien pressure distribution on a profile. This is possible when the supersonic regions are not too large. The formula giving the modified pressure distribution is derived very roughly. It may give only one of the main effects appearing when supersonic speeds occur in the flow, and may be changed and calculated more exactly later. For the calculation of the drag increase, the formula is sufficient. Within the approximation of the theory the lift coefficient is practically unchanged.

N-32757*

Aeronautical Research Council (Gt. Brit.)
A SIMPLE METHOD OF COMPUTING C_D FROM WAKE TRAVERSES AT HIGH-SUBSONIC SPEEDS.
J. S. Thompson. 1954. 12p. diagrs., 4 tabs.
(ARC R & M 2914; ARC 8462. Formerly RAE Aero 2005)

This note gives a convenient method of obtaining C_D from a pitot-static traverse in an airfoil wake, using Jones' modified equation for compressible flow. Charts are provided from which the integrand C_D' can easily be obtained for any point in the traverse, but it is shown that in nearly all cases an accuracy of 1 percent in C_D can be obtained by applying an integrating factor to the area under the total-head loss curve. Three appendices give (a) a summary of the standard theory and equations, (b) details of the construction of the charts, and (c) an empirical equation giving C_D' in a simple analytical form.

N-32861*

Aeronautical Research Council (Gt. Brit.)
NOTE ON THE DYNAMIC CHARACTERISTICS OF SERVO-TAB SYSTEMS OF CONTROL. D. Adamson and D. J. Lyons. 1954. 12p. diagrs., tab. (ARC R & M 2853; ARC 11,666. Formerly RAE Aero 2263)

Curves have been constructed from which estimates can be made of those dynamic characteristics of the servo-tab-type of control which are of chief interest to the designer; namely, the magnitude of the first overshoot of the main flying control beyond its equilibrium position, the lag of the main control surface behind the tab movement, the damping of the main control surface oscillation, and the angular velocity possessed by the main control when it first passes through its equilibrium position.

N-32863*

Aeronautical Research Council (Gt. Brit.)
MODEL TESTS OF AN AIR INTERCHANGE SYSTEM FOR REMOVING ENGINE EXHAUST PRODUCTS FROM A WIND TUNNEL. K. W. Newby, E. G. Barnes and D. W. Bottle. 1954. 32p. diagrs., 3 tabs. (ARC R & M 2639; ARC 11,604. Formerly RAE Aero 2249)

An investigation has been made on the functioning of an air interchange system for removing from a return-circuit wind tunnel a high proportion of the exhaust products from propulsive units under test.

The tests were planned to assist the design of an engine altitude tunnel. The system tested was generally very satisfactory for the specified requirements, and can operate up to interchange ratios of the order of 15 percent without interfering appreciably with the flow in the tunnel working section.

UNPUBLISHED PAPERS

N-15994*

ON BRANCHED POTENTIALS IN SPACE. (Über verzweigte Potentiale in Raum). A. Sommerfeld. September 1954. 36p. diagrs. (Trans. from London Mathematical Soc., Proceedings, v.28, April 8, 1897, p.395-429)

Thomson's method of images and its extension by means of branched potentials is discussed. Green's function of a Riemann space with a simple rectilinear branch curve; applications of Green's function of the winding space to problems of ordinary potential theory; and Green's function of a Riemann space with two parallel rectilinear branching curves and its applications are also discussed.

N-21276*

ON THE STRESS ANALYSIS OF SWEPT WINGS. (Over de sterkteberekening van pijlvormige vleugels). J. P. Benthem. September 1954. 182p. diagrs. (Trans. from Nationaal Luchtvaartlaboratorium, Amsterdam. S. 405)

Methods of stress analysis of swept wings are discussed and reviewed. Many of the references are commented upon.

DECLASSIFIED NACA REPORTS

THE FOLLOWING REPORTS HAVE BEEN DECLASSIFIED FROM CONFIDENTIAL, 10/12/54:

RM A52F27
RM L51L12a

NACA RM A7A15

FLIGHT-TEST MEASUREMENTS OF AILERON CONTROL SURFACE BEHAVIOUR AT SUPERCRITICAL MACH NUMBERS. Harvey H. Brown, George A. Rathert, Jr. and Lawrence A. Clousing. April 23, 1947. 26p. diagrs., photos., 2 tabs. (NACA RM A7A15) (Declassified from Confidential, 10/12/54)

The behavior at supercritical Mach numbers of the ailerons of a jet-propelled fighter has been measured up to 0.866 Mach number. The considerable amount of aileron upfloat occurring at these Mach numbers was found to be due to a large loss in pressure recovery on the upper surface aft of the shock wave which caused very large increases in the aileron hinge moments. Data obtained from pressure distribution measurements are presented to show the very critical effect of Mach number on the magnitude of these hinge moments.

NACA RM A7G03

AN ANALYSIS OF LONGITUDINAL-CO PROBLEMS ENCOUNTERED IN FLIGH SONIC SPEEDS WITH A JET-PROPELL PLANE. Harvey H. Brown, L. Stewart Lawrence A. Clousing. September 25, diagrs., photos., 3 tabs. (NACA RM A (Declassified from Confidential, 10/12/

During flight tests of a jet-propelled ai den pitch-up motion of the airplane occ recovery from a high-speed dive, altho had not moved the controls so as to pro motion. Measurements of the stability characteristics of the airplane and of th sure distribution during the dive and re presented.

NACA RM A7I16

HIGH-SPEED WIND-TUNNEL TESTS O PURSUIT AIRPLANE AND CORRELAT FLIGHT-TEST RESULTS. Joseph W. Lyle J. Gray. January 21, 1948. 56p photos. (NACA RM A7I16) (Declassif Confidential, 10/12/54)

A wind-tunnel investigation of the aero characteristics of a 1/3-scale model o pelled airplane was made at high subso bers for comparison with flight test re were made of wing and fuselage dive-r to determine their effectiveness at hig general, the wind-tunnel results show ment with the flight-test data. Both wi lage dive-recovery flaps were effectiv ing longitudinal control. However, the recovery flaps lost their effectiveness numbers.

NACA RM A51E04

EXPERIMENTAL STUDY OF THE EFI SWEEPBACK ON TRANSONIC AILERO Lionel L. Levy, Jr. and Earl D. Knech September 1951. 20p. diagrs, photo. A51E04) (Declassified from Confident

The effect of sweepback on the Mach n which transonic aileron flutter occurs mined for a wing-aileron combination 65-213, a = 0.5, airfoil section. The range of the investigation extended fro approximately and the Reynolds numbe million. Angle of attack was varied fr for sweep angles of 0° to 50°.

NACA RM A51G10

PRELIMINARY INVESTIGATION OF T FLUCTUATIONS IN THE WAKES OF T DIMENSIONAL WINGS AT LOW ANGL TACK. Robert M. Sorenson, John A James C. Kyle. October 1951. 58p. photos. (NACA RM A51G10) (Declas Confidential, 10/12/54)

An experimental investigation has bee obtain fundamental two-dimensional d tent, magnitude, and other characteri

pressure fluctuations behind airfoils with NACA 23013 and NACA 65_1-213 sections. Results are presented for the airfoil with the NACA 23013 section through a range of Mach numbers from 0.60 to 0.80 and through a range of angles of attack of -2° to $+5^{\circ}$. The report discusses methods of defining wing- and tail-buffet boundaries in terms of pressure fluctuations in the wake.

NACA RM A51H15

LOAD DISTRIBUTION OVER A FUSELAGE IN COMBINATION WITH A SWEPT WING AT SMALL ANGLES OF ATTACK AND TRANSONIC SPEEDS. Maurice D. White and Bonne C. Look. November 1951. 26p. diagrs., photo., tab. (NACA RM A51H15) (Declassified from Confidential, 10/12/54)

Free-fall tests were made at Mach numbers from 0.85 to 1.06 of a wing-body configuration having a 45° sweptback cambered and twisted wing of aspect ratio 6 on a fuselage of fineness ratio 12.4. The distributions of load over the fuselage as determined from surface pressure measurements are shown in relation to the lifts of the wing for small angles of attack. Comparisons are made with wind-tunnel load distributions and with theoretical load distributions for subsonic and supersonic speeds.

NACA RM A51I25

AN ANALYSIS OF THE EFFECT OF STRUCTURAL FEEDBACK ON THE FLUTTER OF A CONTROL SURFACE HAVING POWER-BOOST SYSTEM. Robert H. Barnes. June 1952. 29p. diagrs., photos. (NACA RM A51I25) (Declassified from Confidential, 10/12/54)

A wind-tunnel program was conducted to determine the cause of flutter which had been experienced on an airplane which employed a full power-boost system. Analysis of the data showed that the power-boost control valve was being actuated due to structural deformation. Accordingly, an analytical study was conducted which showed that structural feedback could have been the cause of flutter.

NACA RM A51K27

BODIES OF REVOLUTION FOR MINIMUM DRAG AT HIGH SUPERSONIC AIRSPEEDS. A. J. Eggers, Jr., David H. Dennis and Meyer M. Resnikoff. February 1952. 44p. diagrs., photos. (NACA RM A51K27) (Declassified from Confidential, 10/12/54)

Newtonian impact theory is used to determine body shapes of minimum drag under various combinations of the conditions of given body length, base diameter, surface area, and volume. In addition an estimate is made of centrifugal forces, and their effect on one minimum-drag shape is considered. An experimental investigation carried out in the Ames 10- by 14-inch supersonic wind tunnel on a family of bodies, including two of the minimum-drag shapes, is found to provide a substantiation of the analysis.

NACA RM A51L03a

SOME EFFECTS OF SIDE-WALL MODIFICATIONS ON THE DRAG AND PRESSURE RECOVERY OF AN NACA SUBMERGED INLET AT TRANSONIC SPEEDS. Robert A. Taylor. February 1952. 25p. diagrs., photos. (NACA RM A51L03a. (Declassified from Confidential, 10/12/54)

Comparative data were obtained for an NACA submerged inlet and two ramp-wall modifications of the NACA submerged inlet. These modified inlets were generally superior to the NACA inlet from the standpoint of pressure recovery at the highest test mass-flow ratios. No significant changes in drag were produced by the modification for Mach numbers below 1.0 and for a mass-flow ratio of 0.88, but small increases in drag, at supersonic Mach numbers and the higher angles of attack, resulted from the modifications.

NACA RM A51L17b

A CORRELATION BY MEANS OF THE TRANSONIC SIMILARITY RULES OF THE EXPERIMENTALLY DETERMINED CHARACTERISTICS OF 22 RECTANGULAR WINGS OF SYMMETRICAL PROFILE. John B. McDevitt. February 1952. 60p. diagrs., 3 tabs. (NACA RM A51L17b) (Declassified from Confidential, 10/12/54)

The similarity rules have been used to correlate the experimental data for a series of 22 rectangular, symmetrical wings having NACA 63A0XX sections, aspect ratios from 1/2 to 6, and thicknesses from 2 to 10 percent. The data were obtained by use of the transonic bump technique over a Mach number range of 0.40 to 1.10, corresponding to a Reynolds number range from 1.25 to 2.05 million.

NACA RM A52A29

FLIGHT TESTING BY RADIO REMOTE CONTROL - FLIGHT EVALUATION OF A BEEP-CONTROL SYSTEM. Howard L. Turner, John S. White and Rudolph D. Van Dyke, Jr. April 1952. 55p. diagrs., photos., tab. (NACA RM A52A29) (Declassified from Confidential, 10/12/54)

A comparison between manual control and remote control showed that a beep-type, ratio-remote-control system was, in general; a satisfactory means of control for conducting standard handling-quality flight tests. The dynamic characteristics of the airplane-autopilot combination and the selection of the proper parameter adjustments are discussed.

NACA RM A52B05

FULL-SCALE WIND-TUNNEL INVESTIGATION OF THE EFFECTS OF WING MODIFICATIONS AND HORIZONTAL-TAIL LOCATION ON THE LOW-SPEED STATIC LONGITUDINAL CHARACTERISTICS OF A 35° SWEPT-WING AIRPLANE. Ralph L. Maki. April 1952. 54p. diagrs., photos., 7 tabs. (NACA RM A52B05) (Declassified from Confidential, 10/12/54)

Low-speed lift, drag, and pitching-moment characteristics of a full-scale 35° swept-wing airplane are presented for Reynolds numbers ranging from 3.2×10^6 to 12.3×10^6, and with the horizontal tail on and off and at a lowered position. Similar data are given for the airplane with modified wing leading edges. Selected tuft photographs are given for several configurations.

NACA RM A52B13

THE EFFECT OF BLUNTNESS ON THE DRAG OF SPHERICAL-TIPPED TRUNCATED CONES OF FINENESS RATIO 3 AT MACH NUMBERS 1.2 TO 7.4. Simon C. Sommer and James A. Stark. April 1952. 18p. photos., diagrs. (NACA RM A52B13) (Declassified from Confidential, 10/12/54)

The drag of spherically blunted conical models of fineness ratio 3 was investigated in the Ames supersonic free-flight wind tunnel at Mach numbers from 1.2 to 7.4 in the Reynolds number range from 1.0×10^6 to 7.5×10^6. The models tested had bluntness ratios of nose diameter to base diameter from 0 to 0.50. The use of small amounts of bluntness for minimizing drag and the drag penalties associated with large bluntnesses are discussed.

NACA RM A52C20

DRAG OF CIRCULAR CYLINDERS FOR A WIDE RANGE OF REYNOLDS NUMBERS AND MACH NUMBERS. Forrest E. Gowen and Edward W. Perkins. June 1952. 26p. diagrs., photos. (NACA RM A52C20) (Declassified from Confidential, 10/12/54)

Pressure distribution measurements on a two dimensional circular cylinder have been made at high subsonic and supersonic speeds. Drag coefficients obtained from these measurements are presented with results from other sources. It was found that a maximum drag coefficient of about 2.1 occurs near sonic velocity. As the Mach number was increased to 2.9 the drag coefficient decreased to about 1.34. No effects of Reynolds number were found at supercritical Mach numbers. Effects of fineness ratio on drag of three-dimensional cylinders at supersonic speeds were investigated and found to be small.

NACA RM A52C24

INVESTIGATION OF LIFT AND CENTER OF PRESSURE OF LOW-ASPECT-RATIO, CRUCIFORM, TRIANGULAR, AND RECTANGULAR WINGS IN COMBINATION WITH A SLENDER FUSELAGE AT HIGH SUPERSONIC SPEEDS. Thomas N. Canning and Billy Pat Denardo. June 1952. 28p. diagrs., photos. (NACA RM A52C24) (Declassified from Confidential, 10/12/54)

Low-aspect-ratio triangular and rectangular wings in combination with a slender body have been tested in the Mach number range between 1.3 and 6.2 and Reynolds numbers based on body length from 2.8 to 16 million in the Ames supersonic free-flight wind tunnel. The experimental lift-curve slope and center of pressure positions are compared with theoretical predictions. Drag of the configurations is also presented. The possible lift-drag ratios for the configurations tested are estimated for Mach number 6.0 flight.

NACA RM A52D01a

EFFECTS OF PROPELLER-SPINNER JUNCTURE ON THE PRESSURE-RECOVERY CHARACTERISTICS OF AN NACA 1-SERIES D-TYPE COWL IN COMBINATION WITH A FOUR-BLADE SINGLE-ROTATION PROPELLER AT MACH NUMBERS UP TO 0.83 AND AT AN ANGLE OF ATTACK OF 0°. Robert I. Sammonds and Ashley J. Molk. June 1952. 45p. diagrs., photos., tab. (NACA RM A52D01a) (Declassified from Confidential, 10/12/54)

Measurement of ram-recovery ratio was made in the duct of a cowling-spinner combination. Tests were conducted at Mach numbers from 0.20 to 0.83 with the propeller operating with an "ideal" propeller-spinner juncture (propeller blade extended to spinner surface) and a platform juncture (fixed airfoil-shaped land that permitted blade angle change), and with the propeller removed. Tests were run at propeller blade angles of 60°, 50°, and 40°, for propeller advance-diameter ratios from 1.3 to 4.5 and inlet-velocity ratios from 0.26 to 1.33. All of the tests were conducted at an angle of attack of 0° and a Reynolds number of 1.77 million, based on the maximum diameter of the cowl.

NACA RM A52D11

THE TRANSONIC CHARACTERISTICS OF 38 CAMBERED RECTANGULAR WINGS OF VARYING ASPECT RATIO AND THICKNESS AS DETERMINED BY THE TRANSONIC-BUMP TECHNIQUE. Warren H. Nelson and Walter J. Krumm. July 1952. 173p. diagrs., photos. (NACA RM A52D11) (Declassified from Confidential, 10/12/54)

An investigation was made in the Ames 16-foot high-speed wind tunnel utilizing the transonic-bump technique to determine the aerodynamic characteristics at transonic Mach numbers of 38 cambered rectangular wings. The wings had aspect ratios of 4, 3, 2, 1.5, and 1, and NACA 63A2XX and 63A4XX sections with thickness-to-chord ratios of 10, 8, 6, 4, and 2 percent. The Mach number range was 0.6 to 1.12 with corresponding Reynolds numbers of 1.7 to 2.2 million. The data are presented without analysis.

NACA RM A52D17

EFFECT OF TRAILING-EDGE THICKNESS ON LIFT AT SUPERSONIC VELOCITIES. Dean R. Chapman and Robert H. Kester. July 1952. 24p. diagrs., photos. (NACA RM A52D17) (Declassified from Confidential, 10/12/54)

Lift forces on various rectangular-plan-form wings were measured in the Mach number range between 1.5 and 3.1 at Reynolds numbers between 0.55 and 2.2 million. The wings differed in trailing-edge thickness, profile shape, maximum thickness ratio, and aspect ratio. Measurements were made on wings with and without a boundary-layer trip and are compared to theoretical calculations. Calculated results using shock-expansion theory are presented for Mach numbers up to 10. In general, thickening the trailing edge resulted in an increase in lift-curve slope. This increase varied between a few percent and about 15 percent, depending primarily on the trailing-edge thickness. Calculations indicate that somewhat greater increases are possible at high supersonic Mach numbers.

NACA RM A52D24

SUPPLEMENTARY NOTE ON MODIFIED-IMPACT-THEORY CALCULATIONS FOR BODIES OF REVOLUTION HAVING MINIMUM DRAG AT HYPERSONIC SPEEDS. Meyer M. Resnikoff. July 1952. 13p. diagrs. (NACA RM A52D24) (Declassified from Confidential, 10/12/54)

Newtonian impact theory as modified in NACA RM A51K27, 1952, to include an estimate of centrifugal forces is used to determine bodies for hypersonic flight having minimum pressure foredrag under various combinations of the conditions of given body length, diameter, volume, and surface area.

NACA RM A52E20

AN EXPERIMENTAL INVESTIGATION OF THE BASE PRESSURE CHARACTERISTICS OF NONLIFTING BODIES OF REVOLUTION AT MACH NUMBERS FROM 2.73 TO 4.98. John O. Reller, Jr. and Frank M. Hamaker. September 1952. 47p. diagrs., photos. (NACA RM A52E20) (Declassified from Confidential, 10/12/54)

Base pressure characteristics of related nonlifting bodies of revolution were investigated at free-stream Mach numbers from 2.73 to 4.98 and Reynolds numbers from 0.6 x 10^6 to 3.8 x 10^6. The basic body shape was a 10-caliber tangent ogive with a cylindrical afterbody. The variation of base pressure coefficient with free-stream Mach number and Reynolds number was determined for laminar-, transitional-, and turbulent-boundary-layer flow. The effects of body fineness ratio, nose-profile shape, and afterbody shape (boattail) were also determined in the investigation.

NACA RM A52F13

CONTROL EFFECTIVENESS AND HINGE-MOMENT CHARACTERISTICS AT LOW SPEED OF LARGE-CHORD HORN-BALANCED, FLAP-TYPE CONTROLS ON A TRIANGULAR WING OF ASPECT RATIO 2. Jules B. Dods, Jr. August 1952. 53p. diagrs., photos. 2 tabs. (NACA RM A52F13) (Declassified from Confidential, 10/12/54)

The low-speed lift and hinge-moment characteristics are presented for a triangular wing of aspect ratio 2 having large-chord flap-type controls with a sweptback hinge line and with various sizes and shapes of horn balances. The effects of changes in the following were examined: shielding of the horn balance, percentage of horn balance, trailing-edge thickness, gap nose seal, contour of the horn balance, and Reynolds number. One of the controls which had a nearly optimum balance at low speed was compared with several other types of controls on triangular wings and with comparable triangular-wing con-

NACA RM A52F17

INVESTIGATION OF AN NACA SUBMERGED INLET AT MACH NUMBERS FROM 1.17 to 1.99. Warren E. Anderson and Wilson C. Frazer. September 1952. 29p. diagrs., photo. (NACA RM A52F17) (Declassified from Confidential, 10/12/54)

An investigation was conducted with a small-scale NACA submerged inlet at supersonic Mach numbers from 1.17 to 1.99. The measured performance of a submerged inlet at low supersonic Mach numbers was compared to the calculated performance of a normal-shock scoop inlet on the basis of net thrust coefficients.

NACA RM A52I17

LATERAL AND DIRECTIONAL DYNAMIC-RESPONSE CHARACTERISTICS OF A 35° SWEPT-WING AIRPLANE AS DETERMINED FROM FLIGHT MEASUREMENTS. William C. Triplett and Stuart C. Brown. December 1952. 62p. diagrs., photo., 3 tabs. (NACA RM A52I17) (Declassified from Confidential, 10/12/54)

Lateral and directional dynamic-response characteristics, including frequency responses, transfer functions, and stability derivatives of a 35° swept-wing fighter airplane are obtained from flight measurements of transient responses to rudder and to aileron control deflections. Flight records were obtained at two altitudes between Mach numbers of 0.50 and 1.04. Effects of aeroelasticity are discussed, and test results are compared to predictions based on wind-tunnel and theoretical studies.

NACA RM A53G31

A CORRELATION BY MEANS OF TRANSONIC SIMILARITY RULES OF THE EXPERIMENTALLY DETERMINED CHARACTERISTICS OF 18 CAMBERED WINGS OF RECTANGULAR PLAN FORM. John B. McDevitt. September 1953. 57p. diagrs. (NACA RM A53G31) (Declassified from Confidential, 10/12/54)

The effects of one type of camber on the aerodynamic characteristics of rectangular wing at high subsonic and transonic speeds have been studied by applying the transonic similarity rules to the correlation of experimental data for a series of 18 cambered wings having NACA 63A2XX and 63A4XX sections, aspect ratios from 1 to 4, and thicknesses from 4 to 8 percent. The data were obtained by use of a transonic bump over a Mach number range of 0.6 to 1.1.

NACA RM E51F15

INVESTIGATION OF DYNAMIC CHARACTERISTICS OF A TURBINE-PROPELLER ENGINE. Frank L. Oppenheimer and James R. Jacques. September 1951. 22p. diagrs., tab. (NACA RM E51F15) (Declassified from Confidential, 10/12/54)

Time constants that characterize engine speed response of a turbine-propeller engine over the cruising speed range for various values of constant fuel flow and constant blade angle were obtained both from steady-state characteristics and from transient operation. Magnitude of speed response to changes in fuel flow and blade angle was investigated and is presented in the form of gain factors. Results indicate that at any given value of speed in the engine cruising speed range, time constants obtained both from steady-state characteristics and from transient operation agree satisfactorily for any given constant fuel flow, whereas time constants obtained from

transient operation exceed time constants obtained from steady-stage characteristics by approximately 14 percent for any given blade angle.

NACA RM E51F19

PRELIMINARY INVESTIGATION OF THE CONTROL OF A GAS-TURBINE ENGINE FOR A HELICOPTER. Richard P. Krebs. September 1951. 13p. diagrs. (NACA RM E51F19) (Declassified from Confidential, 10/12/54)

An analog investigation of the power plant for a gas-turbine powered helicopter indicates that currently proposed turbine-propeller engine controls are satisfactory for helicopter application. Power increases from one-half to full rated at altitudes from sea level to 15,000 feet could be made in less than 4 seconds with either the rotor or propellers absorbing the engine power.

NACA RM E51J25

EXPERIMENTAL INVESTIGATION OF THE VIBRATION CHARACTERISTICS OF FOUR DESIGNS OF TURBINE BLADES AND OF THE EFFECT PRODUCED BY VARYING THE AXIAL SPACING BETWEEN NOZZLE BLADES AND TURBINE BLADES. W. C. Morgan and C. R. Morse. February 1952. 28p. diagrs., photos., tab. (NACA RM E51J25) (Declassified from Confidential, 10/12/54)

An investigation was made to determine the effects of varying the spacing between the nozzle blades and the turbine blades of a turbo-jet engine on turbine-blade vibration for four turbine-blade designs of different degrees of stiffness. In general, there was a tendency toward increase in occurrence of vibration with decrease in spacing. The effect was most evident in the case of the turbine blades that had greater stiffness.

NACA RM E51K21

A METHOD FOR ESTIMATING SPEED RESPONSE OF GAS-TURBINE ENGINES. Harold Gold and Solomon Rosenzweig. January 1952. 26p. diagrs. (NACA RM E51K21) (Declassified from Confidential, 10/12/54)

A brief method is presented for estimating the speed response of turbojet and turbine-propeller engines to a step change in fuel flow. The method approximates the dynamic equilibrium in the gas-turbine engine with a first-order linear differential equation the time constant of which varies inversely with the equilibrium speed. The deviation of the calculated values from the mean experimental values is only slightly greater than the spread of experimental data.

NACA RM E52B14

RELATIONS BETWEEN FUEL PROPERTIES AND COMBUSTION CARBON DEPOSITION. Edmund R. Jonash, Jerrold D. Wear and Robert R. Hibbard. April 1952. 67p. diagrs., 3 tabs. (NACA RM E52B14) (Declassified from Confidential, 10/12/54)

Methods for predicting carbon-forming propensity of turbojet-engine fuels from results of simple laboratory tests are discussed with a view toward their application to the control of jet fuel quality. The methods involve the use of aromatic content, hydrogen carbon ratio, distillation temperatures, gravity, aniline point, and several empirical laboratory carbon deposition tests. Most accurate prediction of carbon deposition was obtained with (1) the NACA K factor (function of hydrogen-carbon ratio and volumetric average boiling temperature), and (2) the smoking tendency of the fuel, although this latter method requires additional data to establish reproducibility of the method among laboratories.

NACA RM E52D10

INVESTIGATION OF ENGINE PERFORMANCE AND HIGH-TEMPERATURE PROPERTIES OF PRECISION-CAST TURBINE BLADES OF HIGH-CARBON STELLITE 21 AND CONTROLLED-GRAIN-SIZE STELLITE 21. Charles Yaker, Floyd B. Garrett and Paul F. Sikora. June 1952. 38p. diagrs., photos., 6 tabs. (NACA RM E52D10) (Declassified from Confidential, 10/12/54)

The effect of controlled grain size and increased carbon content on engine performance and high temperature properties of precision-cast Stellite 21 turbine blades was investigated. Blades were cast to result in controlled grain sizes, classed fine, medium, and coarse; others were cast of high-carbon Stellite 21. The blades were operated in a turbojet engine. Laboratory stress-rupture tests of specimens cut from blades were conducted at the stress and temperature encountered during rated-speed engine operation. The results of the engine and laboratory tests indicated that (1) fine-grain Stellite 21 blades had lower life and creep resistance than the medium and coarse-grain blades, and all three grain size blades showed less scatter than the production blades; and (2) higher carbon Stellite 21 had higher blade life than the production Stellite.

NACA RM E52L1[illegible]

BEHAVIOR OF FORGED S-816 TURBINE BLADES IN STEADY-STATE OPERATION OF J33-9 TURBOJET ENGINE WITH STRESS-RUPTURE AND METALLOGRAPHIC EVALUATIONS. F. B. Garrett, C. A. Gyorgak and C. W. Weeton. February 19[illegible]. 29p. diagrs., photos., 3 tabs. (NACA RM E52L[illegible]) (Declassified from Confidential, 10/12/54)

An investigation was conducted to determine the behavior of recently produced forged S-816 turbine blades in a full-scale turbojet engine and, in particular, the scatter in performance of the blades. The turbine blades were operated as continuously as possible at a temperature of 1500° F and a [illegible] stress of 21,500 pounds per square inch. The operating lives of the turbine blades [illegible] to 539 hours, a range of 358 hours. Stress-rupture properties of specimens cut from [illegible] varied considerably, as much as [illegible] at 20,000 pounds per square inch and [illegible]. [illegible] the variability or scatter of stress-rupture data [illegible] greater than that of blade performance, the scatter is probably caused by variations in the properties of the forged blades rather than [illegible] caused by engine operation or installation [illegible]. Metallographic examinations were made to [illegible]

mine possible causes of the scatter and although numerous differences in microstructures of blades were found, no consistent trendencies were observed and the findings did not permit an explanation of the scatter of blade performance. The results of the metallographic examinations and of the physical tests indirectly indicated variables in the fabricating method caused the scatter in properties.

NACA RM E52L30

ADHESIVE AND PROTECTIVE CHARACTERISTICS OF CERAMIC COATING A-417 AND ITS EFFECT ON ENGINE LIFE OF FORGED REFRACTALOY-26 (AMS 5760) AND CAST STELLITE 21 (AMS 5385) TURBINE BLADES. Floyd B. Garrett and Charles A. Gyorgak. February 1953. 21p. photos., diagr., 4 tabs. (NACA RM E52L30) (Declassified from Confidential, 10/12/54)

The adhesive and protective characteristics of National Bureau of Standards Coating A-417 were investigated, as well as the effect of the coating on the life of forged Refractaloy 26 and cast Stellite 21 turbine blades. Coated and uncoated blades were run in a full-scale J33-9 engine and were subjected to simulated service operations consisting of consecutive 20-minute cycles (15 min at rated speed and approximately 5 min at idle). The ceramic coating adhered well to Refractaloy 26 and Stellite 21 turbine blades operated at 1500° F. The coating also prevented corrosion of the Refractaloy 26, a corrosion-sensitive nickel-base alloy, and of the Stellite 21, a relatively corrosion-resistant cobalt-base alloy. Although the coating prevented corrosion of both alloys, it had no apparent effect on blade life.

NACA RM E53A19

COMPARISON OF THEORETICALLY AND EXPERIMENTALLY DETERMINED EFFECTS OF OXIDE COATINGS SUPPLIED BY FUEL ADDITIVES ON UNCOOLED TURBINE-BLADE TEMPERATURE DURING TRANSIENT TURBOJET-ENGINE OPERATION. Louis J. Schafer, Jr., Francis S. Stepka and W. Byron Brown. March 1953. 45p. photos., diagrs., tab. (NACA RM E53A19) (Declassified from Confidential, 10/12/54)

An analysis was made to permit the calculation of the effectiveness of oxide coatings in retarding the transient heat flow into turbine blades when the combustion gas temperature of a turbojet engine is suddenly changed. The analysis is checked with experimental data obtained from a turbojet engine whose blades were coated with two different coating materials (silicon dioxide and boric oxide) by adding silicone oil and tributyl borate to the engine fuel. The very thin coatings (approximately 0.001 in.) that formed on the blades produced a negligible effect on the turbine-blade transient temperature response. From the analysis of this report it was possible to predict the turbine rotor-blade temperature response with a maximum error of 40° F.

NACA RM E53E22

BURNING RATES OF SINGLE FUEL DROPS AND THEIR APPLICATION TO TURBOJET COMBUSTION PROCESS. Charles C. Graves. July 1953. 35p. diagrs., photos., tab. (NACA RM E53E22) (Declassified from Confidential, 10/12/54)

Burning rates were determined for single isooctane drops suspended in various quiescent oxygen-nitrogen atmospheres at room temperature and pressure. The burning rates were compared with those predicted by a previously developed theory based on a heat- and mass-transfer mechanism and with values predicted by a modification to this theory. The drop-burning-rate data were applied to equations for a burning fuel spray in order to calculate the predicted change in burning rate of a fuel spray with variation in oxygen concentration. The results so obtained were compared with the change in combustion efficiency of a single turbojet combustor with inlet oxygen concentration, as determined in a previous investigation. The drop burning rates were proportional to drop diameter and increased approximately 34 percent when oxygen concentration of the surrounding oxygen-nitrogen atmosphere was raised from 17.0 to 34.9 percent by volume. The experimentally determined burning rates agreed well with those predicted by the modified heat- and mass-transfer theory. The predicted change in combustion efficiency with inlet oxygen concentration was appreciably smaller than that observed in the combustor tests.

NACA RM L51E24a

BUFFETING-LOAD MEASUREMENTS ON A JET-POWERED BOMBER AIRPLANE WITH REFLEXED FLAPS. John A. See and William S. Aiken, Jr. August 1951. 28p. diagrs., 3 tabs. (NACA RM L51E24a) (Declassified from Confidential, 10/12/54)

Buffet boundaries, buffeting-load increments for the stabilizers and elevators, and buffeting bending-moment increments for the stabilizers and wings as measured in gradual maneuvers for a jet-powered bomber airplane equipped with reflexed flaps and ailerons and tail tip incidence changes are presented and compared with similar results for the original airplane configuration. The Mach numbers of the tests ranged from 0.35 to 0.81 at pressure altitudes close to 30,000 feet. The predominant buffeting frequencies were close to the natural frequencies of the structural components. The magnitudes and trends of buffeting-load coefficients witn Mach number for the reflexed-flap configuration were similar to those for the original configuration.

NACA RM L51G13

AN INVESTIGATION OF PROPELLER VIBRATIONS EXCITED BY WING WAKES. W. H. Gray and William Solomon. January 1952. 31p. diagrs., photo., tab. (NACA RM L51G13) (Declassified from Confidential, 10/12/54)

This paper shows the effect of airspeed and wing drag on the magnitude of vibratory stresses experienced by a propeller operating in a wing wake. It establishes the linearity of the relation between the stresses and the velocity at a fixed value of wing drag coefficient and between stress and drag coefficient at a fixed velocity. It also shows that an augmented stress may be experienced by a propeller operating too close behind the wing trailing edge.

NACA RM L51I12

PRESSURE PULSATIONS ON RIGID AIRFOILS AT TRANSONIC SPEEDS. Milton D. Humphreys. December 1951. 21p. diagrs., photos., tab. (NACA RM L51I12) (Declassified from Confidential, 10/12/54)

The effect of changes in Mach number, thickness ratio, and angle of attack on the amplitude of the instantaneous pressure pulsations acting on airfoils ranging in thicknesses from 4 to 12 percent chord has been obtained at transonic speeds, and the corresponding flows past the airfoils were recorded by high-speed schlieren motion pictures. The results indicate that reduction in airfoil thickness was accompanied by marked reductions in the severity of the aerodynamic pressure pulsations which contribute to airplane buffeting.

NACA RM L51J24

THE UNSYMMETRICAL LOAD AND BENDING MOMENT ON THE HORIZONTAL TAIL OF A JET-POWERED BOMBER MEASURED IN SIDESLIPPING FLIGHT. T. V. Cooney. January 1952. 19p. diagrs., tab. (NACA RM L51J24) (Declassified from Confidential, 10/12/54)

Results are presented of an analysis of unsymmetrical tail-load and bending-moment measurements made during sideslipping flight tests of a jet-powered bomber airplane having a horizontal tail with 12° of geometric dihedral. The unsymmetrical loads and moments due to dihedral and to induction effects from the vertical tail are deduced from the measurements. A comparison of the results with estimates based on available theory was found to be favorable, suggesting that existing methods might be used to modify present arbitrary design requirements relating to unsymmetrical flight conditions.

NACA RM L51K08

LOW-SPEED STATIC LONGITUDINAL STABILITY AND CONTROL CHARACTERISTICS OF 60° TRIANGULAR-WING AND MODIFIED 60° TRIANGULAR-WING MODELS HAVING HALF-DELTA AND HALF-DIAMOND TIP CONTROLS. Jacob H. Lichtenstein and Byron M. Jaquet. February 1952. 36p. diagrs., photos., tab. (NACA RM L51K08) (Declassified from Confidential, 10/12/54)

The results are presented of an investigation made in the Langley stability tunnel to determine the low-speed static longitudinal stability and control effectiveness characteristics of a basic and a modified 60° triangular-wing model having 10-percent-wing-area half-delta and half-diamond, and 5-percent-wing-area half-diamond tip controls. Comparisons are made between the half-delta and half-diamond controls and between the basic and modified configurations.

NACA RM L51K19

WIND-TUNNEL INVESTIGATION OF A SHIELDED TOTAL-PRESSURE TUBE AT TRANSONIC SPEEDS. William Gracey, Albin O. Pearson and Walter R. Russell. January 1952. 8p. diagrs. (NACA RM L51K19) (Declassified from Confidential, 10/12/54)

The variation of total-pressure error with angle of attack of a shielded total-pressure tube having a curved venturi entry has been determined through an angle-of-attack range of 0° to 60° at Mach numbers ranging from 0.90 to 1.10. The results showed that the tube measured total pressure correctly (to within 1 percent of the impact pressure) for angles of attack up to about 57° at a Mach number of 0.90 and 56° at a Mach number of 1.10.

NACA RM L51K23

THE INTERFERENCE EFFECTS OF A BODY ON THE SPANWISE LOAD DISTRIBUTIONS OF TWO 45° SWEPTBACK WINGS OF ASPECT RATIO 8 FROM LOW-SPEED TESTS AT A REYNOLDS NUMBER OF 4×10^6. Albert P. Martina. February 1952. 48p. diagrs., photo., 2 tabs. (NACA RM L51K23) (Declassified from Confidential, 10/12/54)

Tests of two wing-body combinations have been conducted in the Langley 19-foot pressure tunnel at a Reynolds number of 4×10^6 and a Mach number of 0.19 to determine the effects of the bodies on the wing span load distributions. The wings had 45° sweepback of the quarter-chord line, aspect ratio 8.02, and taper ratio 0.45. One wing was untwisted and incorporated NACA 63_1A012 airfoil sections in the streamwise direction; the second wing was twisted and cambered. The wings were mounted in mid-high-wing positions on identical bodies of revolution of 10:1 fineness ratio having maximum diameters of 10 percent of the spans. The effects on the incremental loading due to the body resulting from wing incidence, upper-surface wing fences, and flap deflection were also determined for the plane wing. The body effects as calculated by using several existing methods are compared with the experimental results.

NACA RM L51K28

LONGITUDINAL FREQUENCY-RESPONSE CHARACTERISTICS OF THE DOUGLAS D-558-I AIRPLANE AS DETERMINED FROM EXPERIMENTAL TRANSIENT-RESPONSE HISTORIES TO A MACH NUMBER OF 0.90. Ellwyn E. Angle and Euclid C. Holleman. February 1952. 28p. diagrs., tab. (NACA RM L51K28) (Declassified from Confidential, 10/12/54)

Transient responses from elevator pulses of the Douglas D-558-I research airplane are analyzed by the Fourier transform to give the longitudinal frequency response of the airplane to a Mach number of 0.90 of altitudes between 30,000 and 37,000 feet.

NACA RM L51K28a

FLUTTER INVESTIGATION OF TWO THIN, LOW-ASPECT-RATIO, SWEPT, SOLID, METAL WINGS IN THE TRANSONIC RANGE BY USE OF A FREE-FALLING BODY. W. T. Lauten, Jr. and Maurice A. Sylvester. February 1952. 12p. diagrs., photo., 2 tabs. (NACA RM L51K28a) (Declassified from Confidential, 10/12/54)

Two thin, interceptor-type (low-aspect ratio), 45° sweptback, untapered wings of solid metal construction have been tested for flutter up to a Mach number of 1.23 by the free-falling-body technique. No flutter was obtained. Flutter calculations yielded results which showed that two-dimensional compressible flow theory is not adequate for predicting flutter for this type of low-aspect-ratio wing in the transonic speed range.

NACA RM L51L04

WIND-TUNNEL INVESTIGATION AT HIGH AND LOW SUBSONIC MACH NUMBERS OF A THIN SWEPTBACK WING HAVING AN AIRFOIL SECTION DESIGNED FOR HIGH MAXIMUM LIFT. Stanley F. Racisz and Nicholas J. Paradiso. February 1952. 46p. diagrs., photo., tab. (NACA RM L51L04) (Declassified from Confidential, 10/12/54)

An investigation has been made of a semispan wing with 45° sweepback, aspect ratio 4, and taper ratio 0.6, equipped with an airfoil section designed to have high maximum lift at low Mach numbers. The lift, drag, and pitching-moment characteristics were determined at Reynolds numbers ranging from 2×10^6 to 9×10^6 for Mach numbers below 0.2 for the wing with and without a split flap. The characteristics of the plain wing were also determined for several values of the Reynolds number at Mach numbers up to about 0.95. The results are compared with results obtained from tests of a wing with the same plan form but with the NACA 65A006 airfoil section.

NACA RM L51L11

AERODYNAMIC CHARACTERISTICS AT TRANSONIC SPEEDS OF A TAPERED 45° SWEPTBACK WING OF ASPECT RATIO 3 HAVING A FULL-SPAN FLAP TYPE OF CONTROL WITH OVERHANG BALANCE. TRANSONIC-BUMP METHOD. Vernard E. Lockwood and John R. Hagerman. January 1952. 24p. diagrs. (NACA RM L51L11) (Declassified from Confidential, 10/12/54)

Lift, pitching-moment, rolling-moment, and flap hinge-moment coefficients were obtained by the transonic bump method on a 45° sweptback wing of aspect ratio 3, and taper ratio of 0.5, and an NACA 64A010 section, employing a 0.254-chord full-span flap. The flap had a 50-percent flap-chord elliptical-nose overhang. The investigation was made at angles of attack of -4°, 0°, 4°, and 8°, flap deflections from -28° to 6°, and Mach numbers from 0.6 to 1.15. The results are compared with the same flap without overhang.

NACA RM L51L14

LOW-SPEED TESTS OF A FREE-TO-YAW MODEL IN TWO WIND TUNNELS OF DIFFERENT TURBULENCE. Jones F. Cahill and John D. Bird. February 1952. 12p. diagrs., photos. (NACA RM L51L14) (Declassified from Confidential, 10/12/54)

Tests have been made at low speeds in the Langley low-turbulence pressure tunnel which has a very low turbulence level and the Langley stability tunnel which has a turbulence level approximately ten times as great in order to determine the extent of any resulting oscillations of a model mounted with freedom in yaw and in order to demonstrate the extent to which directional fluctuations in an air stream can be responsible for such oscillations. Tests covered a range of dynamic pressures from 4 to 175 pounds per square foot with associated ranges of Reynolds numbers and Mach numbers from 1.5×10^6 to 4.6×10^6 and 0.05 to 0.34, respectively.

NACA RM L51L19

PRELIMINARY INVESTIGATION OF THE EFFECTS OF A PADDLE BALANCE ON THE CONTROL CHARACTERISTICS AT TRANSONIC SPEEDS OF A TAPERED 45.58° SWEPTBACK WING OF ASPECT RATIO 3 HAVING A FULL-SPAN FLAP-TYPE CONTROL. William C. Moseley, Jr. February 1952. 24p. diagrs., photo. (NACA RM L51L19) (Declassified from Confidential, 10/12/54)

A preliminary investigation at transonic speeds was made on a wing having a quarter-chord line swept back 45.58°, an aspect ratio of 3, a taper ratio of 0.5, and an NACA 64A010 airfoil section. The Reynolds number of the tests was approximately 1,000,000. The wing had a full-span flap tested with and without a paddle balance. The paddle balance was capable of balancing excessive control hinge moments with only slight effects on the lift and rolling-moment characteristics.

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